

Patent Claims

1. A method for operating a measurement probe for measuring a gas concentration in a measuring gas with the aid of a solid electrolyte which conducts oxygen ions and has a measurement cavity for holding the measuring gas, a measuring electrode and an external electrode, a pumping current flowing between the measuring electrode and external electrode transporting oxygen ions from the measuring electrode to the external electrode, characterized in that the measuring electrode is checked by determining the electrode area effectively available for oxygen diffusion, or a value dependent thereon.

2. The method as claimed in claim 1, characterized in that the measuring electrode is checked by

- setting a predetermined oxygen concentration in the measurement cavity,
- impressing a predetermined constant pumping current between the measuring electrode and external electrode, and measuring the resulting Nernst potential at the measuring electrode,
- measuring the period of time until the measured Nernst potential jumps from small to large values,
- comparing the measured period of time with a predetermined threshold value,
- establishing a defect in the measuring electrode when the measured period of time falls below the predetermined threshold value.

3. The method as claimed in claim 2, characterized in that the predetermined constant pumping current is selected to be so large that even in the case of an intact measuring electrode more oxygen is transported from the measuring electrode to the external electrode than can subsequently diffuse into the measuring electrode.

4. The method as claimed in claim 1, characterized in that the measuring electrode is checked by

- impressing a predetermined constant pumping current between the measuring electrode and external electrode,
- varying the oxygen concentration in the measurement cavity and measuring the resulting Nernst potential at the measuring electrode,
- determining the oxygen concentration at which the measured Nernst potential jumps between small and large values,
- comparing the determined oxygen concentration with a reference value, and
- establishing a defect in the measuring electrode when the determined oxygen concentration deviates from the reference value by more than a predetermined amount.

5. The method as claimed in claim 4, characterized in that the oxygen concentration in the measurement cavity is determined by measuring the Nernst potential at an auxiliary electrode in the measurement cavity.

6. The method as claimed in claim 1, characterized in that the measuring electrode is checked by

- setting a predetermined oxygen concentration in the measurement cavity,
- impressing a pumping current between the measuring electrode and external electrode that is set such that a predetermined value of the Nernst potential is present at the measuring electrode,
- varying the oxygen concentration in the measurement cavity and adjusting the pumping current between the measuring electrode and external electrode such that the Nernst potential at the measuring electrode is kept constant,
- determining the proportionality factor between the pumping current and oxygen concentration,

- comparing the determined proportionality factor with a reference value, and
- establishing a defect in the measuring electrode when the determined proportionality factor deviates from the reference value by more than a predetermined amount.

7. The method as claimed in claim 6, characterized in that two predetermined values of the oxygen concentration are set in the measurement cavity at which the pumping current is set in each case such that the predetermined value of the Nernst potential is present at the measuring electrode, and the proportionality factor between the pumping current and oxygen concentration is determined from the two values for the pumping current set.

8. The method as claimed in claim 6 or 7, characterized in that a detachment of a cover layer lying over the measuring electrode is established when the determined proportionality factor exceeds a reference value by more than a predetermined amount.

9. The method as claimed in one of claims 6 or 7, characterized in that a detachment of a cover layer lying over the measuring electrode and of the measuring electrode is established when the determined proportionality factor falls below the reference value by more than a predetermined amount.

10. The method as claimed in claim 1, characterized in that the measuring electrode is checked by

- setting a predetermined oxygen concentration in the measurement cavity,
- impressing a pumping current between the measuring electrode and external electrode that is set such that a predetermined value of the Nernst potential is present at the measuring electrode,

- comparing the pumping current set with a reference value, and
- establishing a defect in the measuring electrode when the pumping current set deviates from the reference value by more than a predetermined amount.

11. The method as claimed in claim 10, characterized in that a detachment of only a cover layer lying over the measuring electrode is detected when the pumping current set exceeds the reference value by more than a predetermined amount.

12. The method as claimed in claim 10, characterized in that a detachment of the cover layer lying over the measuring electrode and of the measuring electrode is established when the pumping current set falls below the reference value by more than a predetermined amount.

13. The method as claimed in one of the preceding claims, characterized in that the measuring electrode is checked with each start of operation of the measuring probe.

14. The method as claimed in one of the preceding claims, characterized in that the measuring electrode is checked on demand, in particular by a control unit.